Sodium, Potassium and Water (2010 Dietary Guidelines Advisory Committee)

Overview, Needs for Future Research

Overview:

Dietary intakes of sodium, potassium and water have substantial health effects. Excessive sodium intake, especially when accompanied by inadequate potassium intake, raises blood pressure (BP), a well-accepted and extraordinarily common risk factor for stroke, coronary heart disease (CHD) and kidney disease.

Adverse effects of sodium on BP appear to begin early in life. Because of worsening BP levels in children in the United States, the 2010 Dietary Guidelines Advisory Committee (DGAC) decided to evaluate available research on the health effects of sodium in children, as well as update the 2005 DGAC's review of research on the health effects of sodium in adults.

While the vast majority of research on the health effects of sodium, potassium and water on adults was published before 2005 and synthesized in the 2005 DGAC report, the Subcommittee conducted a NEL systematic review to build upon those findings and add relevant new literature from updated searches. The new focus involves considerably more effort in reviewing the emerging and growing evidence on the BP effects of sodium in children.

Elevated BP is a highly prevalent, etiologically relevant and modifiable risk factor for cardiovascular and renal diseases. A low intake of dietary potassium, especially in the presence of high sodium intake, has been implicated in the pathogenesis of elevated BP. The 2005 DGAC reviewed available evidence from the relationship between potassium intake and BP and concluded that an increased intake of potassium lowers BP. The 2010 DGAC performed an updated search of literature published since 2005 to identify new research on the relationship between potassium intake and BP.

Recommendations for water are made to prevent the deleterious, primarily acute, effects of dehydration. These effects include impaired cognitive function and motor control. Although a low intake of water has been associated with an increased risk of kidney stones and other chronic diseases, this evidence was insufficient for the 2005 DGAC to establish quantitative recommendations for water consumption.

The 2010 DGAC conducted exploratory literature searches on the relationship of water intake with hydration, kidney stones, body weight, and cancer. These searches revealed that for the purposes of

Subcommittee Members:

- Lawrence J. Appel, MD, MPH (Chair); Johns Hopkins University
- Thomas A Pearson, MD, PhD, MPH; University of Rochester
- Linda V. Van Horn, PhD, RD, LD; Northwestern University
- Christine Williams, MD, MPH; Columbia University (Retired)

NEL Project Managers:

- Donna Blum-Kemelor, MS, RD, LD
- Joan M.G. Lyon, MS, RD, LD

NEL Support Staff:

- Joanne Spahn, MS, RD, FADA - Director
- Yat Ping Wong, MPH, MLS - Librarian

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identifying health problems related to water intake in the general population, little additional evidence on these topics has been published after the 2005 DGAC report.

Needs for Future Research:

1. Conduct studies, including clinical trials, in children to determine the effects of sodium on BP and the age-related rise in BP.

- **Rationale:** The problem of elevated BP begins in childhood, well before BP levels cross the threshold that defines hypertension (HTN) in adults (140/90mmHg).

2. Conduct trials that determine the effects of sodium reduction on clinically relevant non-blood pressure variables, such as left ventricular mass, proteinuria and bone mineral density (BMD).

- **Rationale.** An inclusive body of evidence suggests that the benefits of a lower sodium intake extend beyond reduced BP. Evidence from cross-sectional studies has documented that sodium is directly associated with left ventricular mass and proteinuria. Clinical trials have also documented that a higher intake of sodium increases urinary calcium excretion.

3. Conduct controlled trials that test whether increased potassium intake through supplements or potassium-rich foods increase BMD.

- **Rationale:** A consistent body of evidence from observational studies indicates that increased intake of potassium from foods is associated with greater BMD and with evidence of reduced bone turnover. Data from small trials also have documented that increased intake of potassium reduces bone turnover.

4. Conduct dose-response trials that test the main and interactive effects of sodium and potassium intake, as well as possible impact of other minerals (e.g., calcium, magnesium) on BP and other clinically relevant outcomes.

- **Rationale:** There remains a need for dose-response trials, particularly for potassium, that span a clinically relevant range of dietary intake. Also, the interactive effects of sodium and potassium are of considerable interest.

5. Investigate the role of increased total fluid intake as a means to prevent chronic diseases.

- **Rationale:** A few studies suggest that increased fluid consumption might reduce the risk of bladder cancer, urinary tract infections, kidney stones, and colon cancer. However, this

Dietary Guidelines Management Team:

- Holly McPeak, MS (Lead); HHS/ODPHP
- Patricia Guenther, PhD, RD; USDA/CNPP

Acknowledgements

evidence was insufficient to make recommendations on fluid intake.